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Synchronized Business Cycles in East Asia and Fluctuations in the Yen/Dollar Exchange Rate

Ronald McKinnon and Gunther Schnabl

1. INTRODUCTION

Should the Japanese yen be depreciated to revive the Japanese economy? Since the bursting of the stock-and land-market bubbles in 1990-91, the Japanese economy has fallen into its deepest postwar recession. Because fiscal policy and monetary policy are at their limits in combating recession and deflation, a possible foreign exchange policy "solution" has gained wide attention.

For instance, McCallum (2000) proposes to stimulate Japanese output through unsterilized foreign exchange intervention. Meltzer (1999) states that yen devaluation by unsterilized foreign currency purchases would restore Japan's competitive position in the world economy and thus support a sustained recovery. Svensson (2000) presumes to have found a "*foolproof way of escaping from the liquidity trap*" by combining an inflation target with a real yen depreciation. The IMF (2001: 33-34) has urged the Bank of Japan "*to use all instruments at its disposal to combat deflation*", i.e., to further expand money supply and to depreciate the yen.

In late 2002 several Japanese officials—hoping that a weaker yen would boost the country's ailing economy—stepped up efforts to talk the yen lower. The financial services minister Takenaka expressed its desire for a weaker yen. Similarly, the finance Minister Shiokawa has repeatedly stated that the yen is overvalued.[1]

RONALD MCKINNON is William D. Eberle Professor of International Economics at Stanford University, <mckinnon@stanford.edu>. GUNTHER SCHNABL is from the Faculty for Economics and Business Administration of Tübingen University, <gunther.schnabl@uni-tuebingen.de>

[1] *Financial Times* 9 December 2002.

However, Okina (1999: 179) from the Bank of Japan rejects the demands for a weaker yen. Large scale purchases of foreign currency by the Japanese authorities with the aim of depreciating the yen could provoke opposition from its major trading partners and be criticized as a beggar-thy-neighbour policy. Japan's small East Asian neighbour countries vehemently oppose a weaker yen (*The Economist* 2002).

The proponents of a significant yen depreciation doubt that it would hurt Japan's smaller neighbouring economies. Bernanke (2000: 161) argues that the beggar-thy-neighbour argument against competitive devaluation had its origins in the Great Depression and does not apply to contemporary Japan and East Asia. According to Meltzer (1999: 189-190) a yen devaluation has no strong negative impacts on Japan's trading partners, particularly if the positive impact of a Japanese recovery is counted: *"In my view – and supported by the experience of the past decade – devaluation would be a cheaper, and I believe, faster way to restore prosperity to Japan and its neighbours."*

Svensson (2000) and the IMF (2000: 28-30, 2001: 28-29) assume that the negative effect which a yen depreciation might cause in East Asia's smaller countries would be more than offset by more Japanese imports from the region. In an IMF working paper Callen and McKibbin (2001) apply a macroeconomic G-cubed Asia-Pacific model with international trade and capital flows to explore how yen depreciation affects the smaller East Asian economies. They contend that Japanese monetary expansion coupled with yen depreciation would have *"minimal"* effects (p. 35) on the rest of Asia.

In this paper, however, we contend that the opposite is true. Updating a model pioneered by C.H. Kwan, we show that the current and lagged effects of a yen depreciation on output in the smaller East Asian economies have been strongly negative. Within plausible ranges of income growth in Japan or movements in the yen/dollar exchange rate, the positive impulse of more regional imports from Japan should Japanese income growth increase is swamped by the negative effect of substantial yen depreciation. Indeed, for the past two decades, fluctuations in the yen/dollar rate have generated a synchronized business cycle in the smaller East Asian economies.

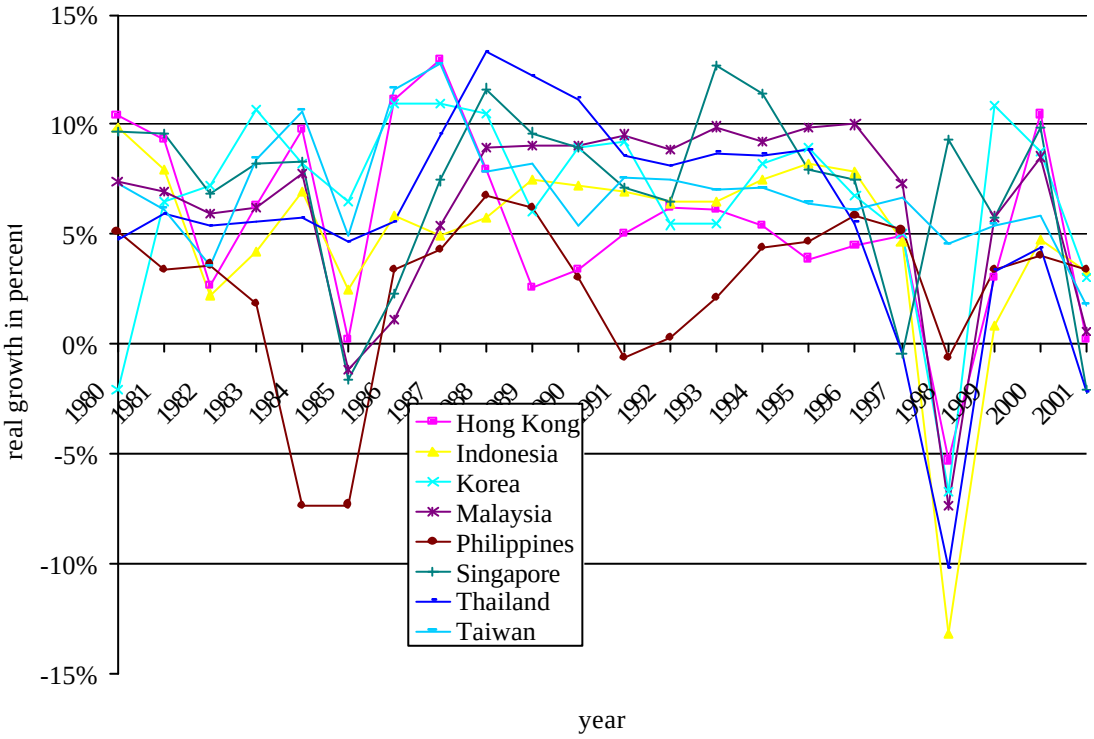
2. GROWING ECONOMIC INTEGRATION AND SYNCHRONIZED BUSINESS CYCLES IN EAST ASIA

Since the early 1980s, East Asian countries outside Japan chose a development strategy based on international trade and sound macroeconomic policies. Their subse-

quent rapid export-led economic growth with fiscal balance and relative price-level stability led to what the World Bank (1993) called the "The East Asian Miracle".

Less well known is that these high-growth economies have experienced a synchronized business cycle. Figure 1 suggests—as it will be shown later on by econometric estimations—that, since 1980, the real GDPs of the smaller East Asian economies have fluctuated in parallel. In particular, growth rates of Hong Kong, Indonesia, Korea, Malaysia, Taiwan, and Thailand have been highly correlated. These countries are the core of the East Asian business cycle, to which the Philippines and Singapore are more loosely attached.

Figure 1: Synchronized Business Cycles in East Asia (EA_1), 1980-2001 (Yearly)



Source: IMF: IFS, Central Bank of China. EA_1 = Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand.

For ease of notation, let us denote the bloc of the eight smaller East Asian countries—Hong Kong, Korea, Singapore, Taiwan, Indonesia, Malaysia, the Philippines, and Thailand—by EA_1. Then EA_2 is EA_1 plus China; and EA_3 is EA_2 plus Japan.

Output synchronization in the EA_1 countries springs from several related factors. First, their regional proximity and growing direct trade linkages have strengthened economic interdependence. More indirectly, they have been export competitors in

third markets such as the United States and Japan. Second, they followed similar exchange rate, monetary, and fiscal policies. Third, the EA_1 countries were and are directly or indirectly affected by exogenous fluctuations in the yen/dollar exchange rate, our primary focus in this paper.

International trade has been the driving force behind the "miracle" growth with rapid industrialization. Initially, the East Asian economies relied heavily on exports to, and imports from, the United States, Japan, and other industrial countries. In the last two decades, however, intra-East Asian trade became relatively more important (Urata, 2001). From 1980 to 2001, Table 1 shows that exports to other EA_1 countries rose from 18.9 per cent to 26.0 per cent of overall EA_1 exports. The share of imports from other EA_1 countries increased from 15.3 per cent to 25.3 per cent. If China is included, the share of intra-regional trade increases further: EA_2 exports to other EA_2 countries increased from 21.7 per cent in 1980 to 36.9 per cent in 2001.

Table 1: Intra-Asian Trade, 1980-2001

	Exports			**Imports**		
	EA_3	**EA_2**	**EA_1**	**EA_3**	**EA_2**	**EA_1**
EA_1						
1980			18.9			15.3
1990			22.2			19.6
2001			26.0			25.3
EA_2						
1980		21.7			18.2	
1990		32.0			30.1	
2001		36.9			41.5	
EA_3						
1980	32.0			31.8		
1990	39.6			42.9		
2001	46.5			53.1		

Source: IMF: Direction of Trade Statistics. EA_1 = Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, EA_2 = EA_1 + China, EA_3 = EA_2 + Japan

In contrast, East Asian trade with industrial countries other than the United States has declined comparatively. Table 2 shows that EA_1 exports to Japan fell from 19.2 per cent in 1980 to 10.8 per cent in 2001—although imports from Japan fell somewhat less. The relative shift away from trade with Rest of World (ROW) is even more strik-

ing.[2] The share of exports to ROW as a percentage of overall exports declined from 37.3 per cent in 1980 to 29.2 per cent in 2001. Including China, Table 2 also shows that the relative decline in EA_2 trade with ROW is just as pronounced.

Table 2: East Asian Trade with China, Japan, US, and ROW, 1980-2001

	Exports				Imports			
	China	**Japan**	**US**	**ROW**	**China**	**Japan**	**US**	**ROW**
EA_1								
1980	1.5	19.2	23.1	37.3	4.7	23.8	17.1	39.1
1990	6.4	14.4	24.9	32.0	9.4	23.0	16.1	31.9
2001	13.1	10.8	20.4	29.6	14.7	19.6	14.3	24.8
EA_2								
1980		19.6	20.9	37.6		24.2	17.4	40.2
1990		14.4	22.5	31.1		21.9	15.6	32.4
2001		12.3	20.4	30.4		16.2	13.1	29.2
EA_3								
1980			22.6	45.4			17.4	50.8
1990			26.2	34.2			18.1	39.0
2001			23.1	30.7			14.4	32.5

Source: IMF: Direction of Trade Statistics. EA_1 = Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, $EA_2 = EA_1$ + China, $EA_3 = EA_2$ + Japan, ROW = Rest of the World.

Instead of relying on exports to—and imports from—the industrial countries as the sole driving force behind their rising incomes, the smaller East Asian countries have developed their own economic dynamics. While there is no doubt that the intensification of intra-Asian trade and the synchronization of the business cycles are closely intertwined, the causality is unclear. Do closer trade linkages contribute to a common business cycle or are there common external shocks, or both?

Theoretically, rising trade between two countries can result in greater or weaker synchronization of aggregate demand fluctuations (Frankel and Rose, 1998). If two countries engage in Heckscher-Ohlin or Ricardian type trade, they become more specialized in certain economic sectors or industries. Thus their business cycles tend to be more idiosyncratic. As trade in dissimilar products between two countries increases, with one country specializing in the production of, say, cars and the other specializing in the production of palm oil, both countries will react differently to industry-specific exogenous shocks. Business cycles will differ.

[2] ROW trade is dominated by the European countries.

Suppose, however, intra-industry trade predominates as in electrical equipment and semiconductors. Because one country both imports from, and exports this equipment to the other, exogenous shocks will affect both in the same way. Business cycles will be synchronous. A sudden decline in the demand for computers would slow economic growth in both countries.

Because both types of trade patterns can be observed, the impact of strengthened trade linkages on the common business cycle is ambiguous. First, the "newly" industrialized club of Hong Kong, Korea, Singapore, and Taiwan—of which China is an increasingly important member—have highly developed and capital-intensive industries where intra-industry trade could be important. Second, the ASEAN core countries of Indonesia, Malaysia, Philippines, and Thailand focus more on agricultural products, raw materials, and labour-intensive products, where intra-industry trade is less important. Between the two groups (horizontal) inter-industry trade as well as (vertical) intra-industry trade within the East Asian production system are possible.

The upshot is that industry-specific random shocks are unlikely to generate the highly synchronized business cycles shown in Figure 1. Instead we must look for macroeconomic shocks that affect aggregate demand and broad industrial competitiveness across the board in East Asia outside of Japan. Whence our focus on fluctuations in the yen/dollar exchange rate.

3. FLUCTUATIONS IN THE YEN/DOLLAR EXCHANGE RATE: THE LOOSE CANNON

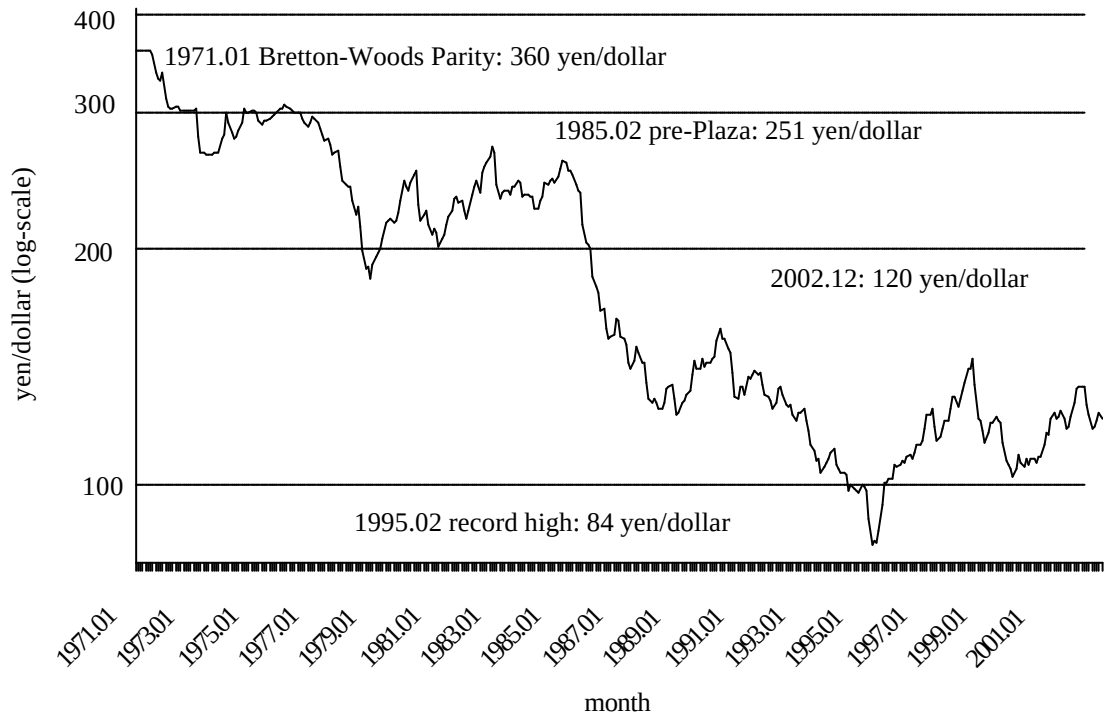
Central to our argument is the fact that all East Asian countries, except Japan itself, tend to stabilize their exchange rate against the US dollar in non crisis periods. Before the Asian crisis of 1997-98, all smaller East Asian countries pegged to the US currency—more on a high frequency day-to-day or week-to-week basis, but with some drift at lower frequencies of observation. McKinnon (2000, 2001) called this mutual exchange rate stabilization "The East Asian Dollar Standard".

Contrary to the IMF's urging, by 2002 the East Asian countries other than Japan are returning—or have returned—to their pre-crisis practices of pegging to the dollar (McKinnon and Schnabl 2002). Indeed, now China, Hong Kong, and Malaysia appear to be firmly pegged to the dollar at all frequencies of observation—although Indonesia remains an out-of-control outlier. The other East Asian countries (except Japan)

pursue looser, but still rather tight pegs to the dollar on a high-frequency basis. Because the dollar is the dominant currency for invoicing intra-regional trade and denominating international capital flows, the smaller East Asian economies peg to the dollar to reduce payments risk and to anchor their domestic price levels. But this leaves them vulnerable to changes in the yen/dollar exchange rate.

Due to their export orientation and their relatively small size, the EA_1 economies are already very open. In 2001, trade (exports + imports) as a percentage of GDP ranges from 74 per cent in Indonesia to 277 per cent in Hong Kong—reflecting the latter's status as the center of entrepôt trade with the Chinese mainland. Although international trade has been—and will be—a critical factor in their economic success, it also increases their collective vulnerability to foreign "shocks". And fluctuations in the yen/dollar exchange rate have been the most important of these shocks.

Figure 2: Yen/Dollar Exchange Rate, 1971-2002 (Monthly)



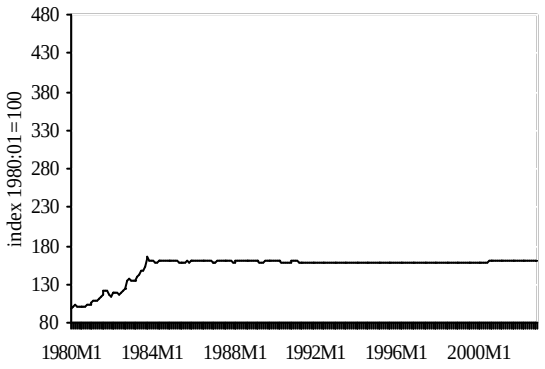
Source: IMF: IFS.

Alone among East Asian countries, Japan has chosen, or been forced to accept (McKinnon and Ohno, 1997), a situation where its currency varies widely against the dollar (Figure 2). Since the early 1971, Figure 2 shows the yen appreciating from its Bretton Woods Parity of 360 yen per dollar to around 120 yen per dollar today (early

2003). Although the trend of continual yen appreciation seemingly ended in 1995, fluctuations in the yen/dollar exchange rate have not abated in the last decade. Figure 2 also shows the large variations in the yen/dollar exchange rate since 1990.

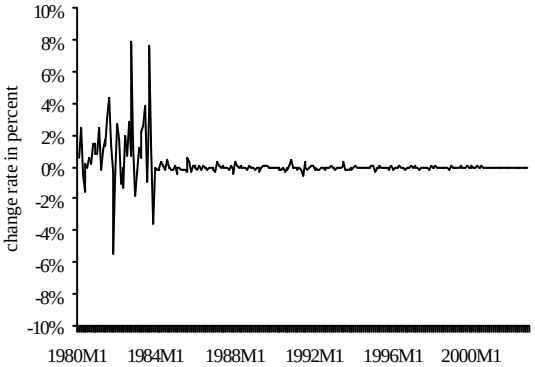
By keeping their exchange rates stable against the dollar, the smaller East Asian economies must cope with extraneous fluctuations of the dollar against the yen. To illustrate the magnitude of this problem over the past decade, Figure 3 shows the large fluctuations of the yen against the Hong Kong dollar—which remained firmly pegged to the US dollar since the early 1980s. The upper panels in Figure 3 show the gradual swings of the absolute Hong Kong dollar exchange rate against US dollar and yen, the lower panels show the monthly percentage exchange rate fluctuations. Clearly in both terms—gradual absolute swings and relative changes—the yen/dollar exchange rate is a volatile outlier for Hong Kong in specific and the East Asian exchange rate system as a whole. This imbalance has important consequences.

Figure 3: Hong Kong Dollar against US Dollar and Yen, 1980-2002 (Monthly)

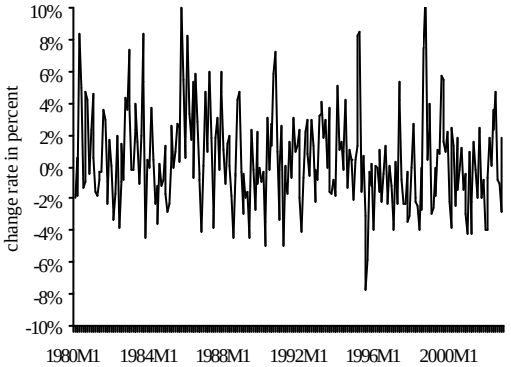


absolute rate against the US dollar

absolute rate against the Japanese yen



relative changes against the US dollar



relative changes against the Japanese yen

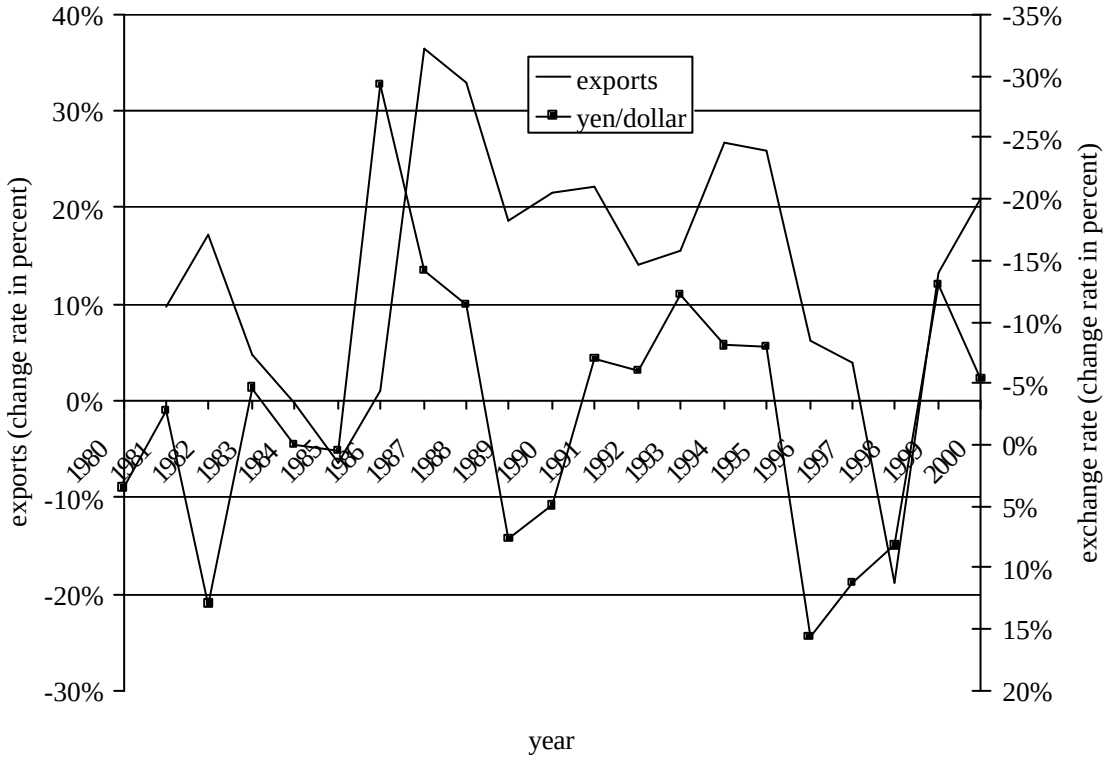
Source: IMF: IFS.

The yen/dollar exchange rate affects collective EA_1 output in two ways: trade and foreign direct investment (Kwan, 2001). The first is a real exchange rate or interna-

tional competitiveness effect. Yen/dollar fluctuations impact Japan's international competitiveness both against the United States and against all the other East Asian countries—which peg to the dollar. While yen appreciation stimulates EA_1 exports to Japan and to the rest of the world, yen depreciation impairs the international competitiveness of the EA_1 economies. When the yen depreciates, EA_1 imports and competition from Japanese goods increase while their exports decline.

Figure 4 shows that the exports of the smaller East Asian countries have fluctuated with the yen/dollar exchange rate. When the yen appreciated, such as following the Plaza Agreement (September 1985), EA_1 exports strongly expanded. In contrast, yen depreciation after 1995 slowed East Asian export expansion significantly. And the sharp yen depreciation of 1996-98 greatly worsened the crisis in other East Asian economies in 1997-98. The change in overall EA_1 exports can be subdivided into a Japan, an intra-Asian, and a third market effect. Although not plotted here, all the three effects move in parallel with respect to changes in the yen/dollar exchange rate.

Figure 4: East Asian (EA_1) Exports and the Yen/Dollar Exchange Rate, 1980-2001 (Yearly)

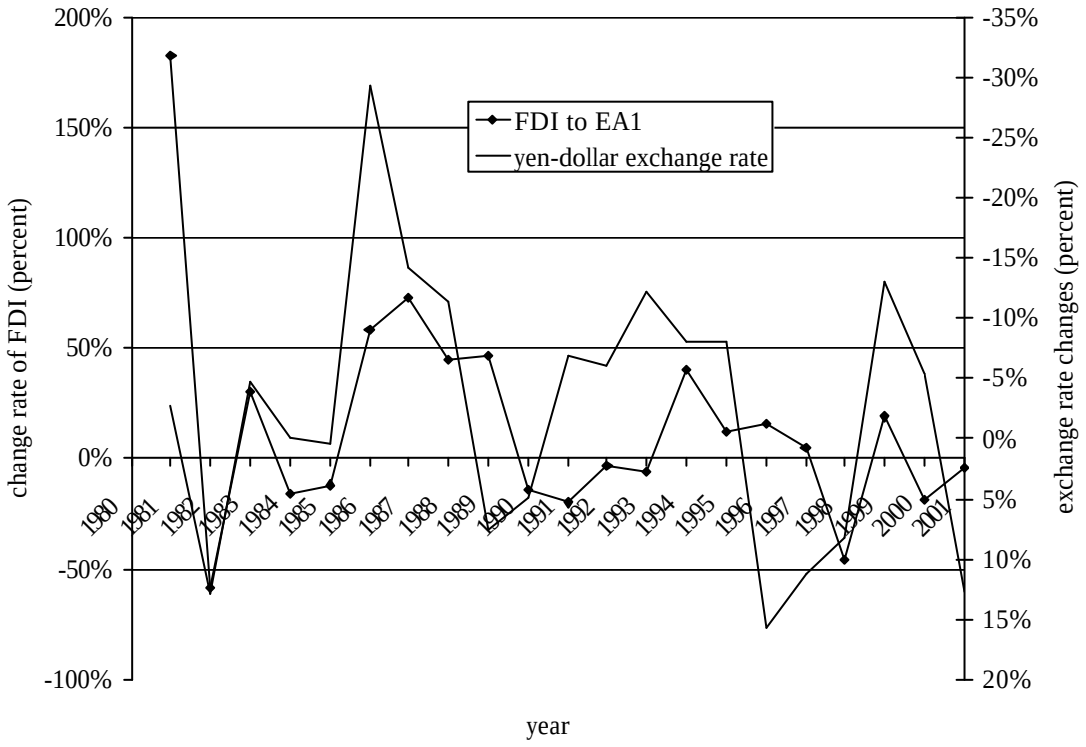


Source: IMF: IFS. Note: EA_1 exports only excluding China and Japan.

The second transmission channel is Japanese foreign direct investment (FDI) into the rest of East Asia. FDI is highly correlated with the yen/dollar exchange rate. FDI accelerates when the yen appreciates (Figure 5) because production and investment in Japan itself becomes relatively more expensive. When the yen is high and appreciating, the influx of Japanese long-term capital and know-how boosts domestic gross fixed investment in EA_1 and stimulates output—and vice versa when the yen is low.

The exchange-driven nature of Japanese FDI was particularly pronounced in the early 1990s. When the yen rose from 145 per dollar in 1990 to less than 80 per dollar in 1995, Japanese FDI to EA_1 increased fast (Figure 5). Japanese multinationals and even small and medium enterprises shifted unprofitable (parts of) the production process to the low-wage and generally lower-cost East Asian countries. In Japan, this rationalization process was perceived as hollowing out (*kûdôka*) of the Japanese economy, while it provided an additional growth stimulus to its small neighbours.

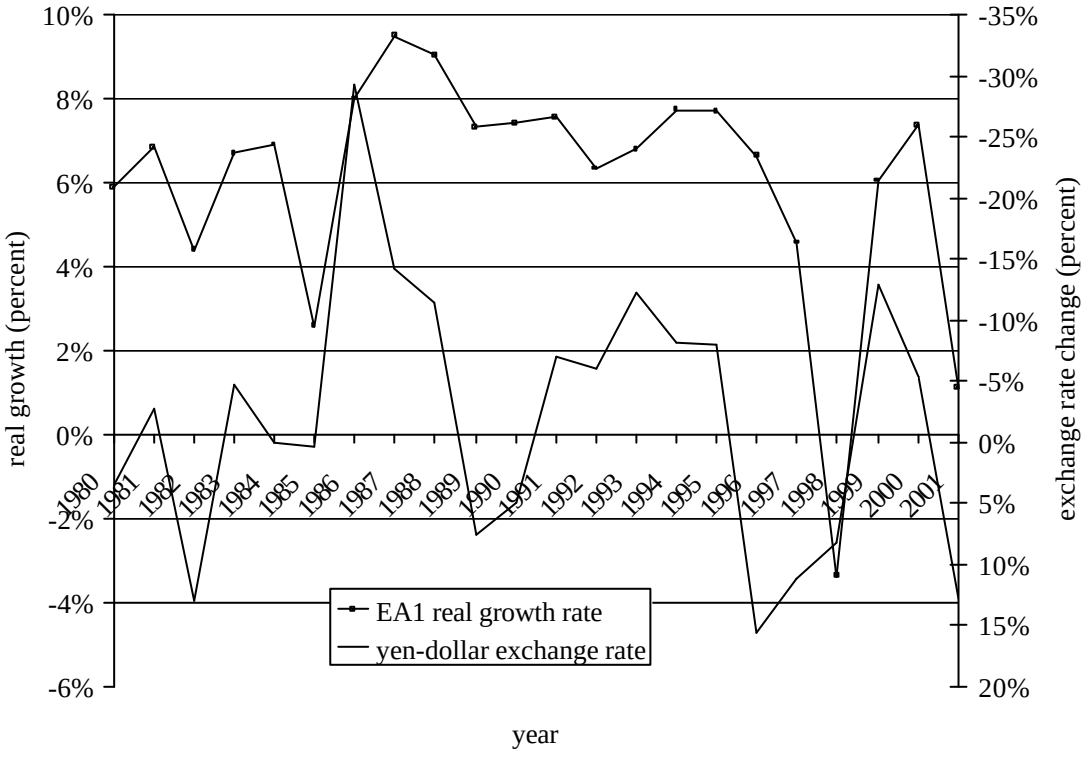
Figure 5: Japanese Foreign Direct Investment to East Asia (EA_1) and the Yen/Dollar Exchange Rate, 1980-2001 (Fiscal Years)



Source: Japan: Ministry of Finance and IMF: IFS.

Froot and Stein (1991) give another explanation for the dependence of FDI on exchange rates. The exchange rate affects foreign direct investment (and thus domestic investment) more when firms are capital constrained. The profits of an FDI acquisition of real estate or production facilities are much more difficult to know for outsiders than is the case for portfolio investment because of asymmetric information.[3] Thus, the more internal financing (wealth) a firm can bring into a FDI project, the lower will be the total costs. An appreciation of the domestic currency increases the relative net worth of the domestic enterprise for investing abroad, and the domestic investor can bid more aggressively for foreign assets. The FDI out of the home country increases.

Figure 6: The East Asian (EA_1) Business Cycle and the Yen/Dollar Exchange Rate, 1980-2001 (Yearly)



Source: IMF: IFS, Central Bank of China.

[3] External financing is assumed to be more expensive than internal financing because external creditors face higher costs to observe profits. While the domestic enterprise knows the profit of an FDI project, the outside creditor faces higher costs to acquire the information about the "true" return.

Figure 6 shows that the EA_1 countries[4] tend to grow faster when the yen is appreciating—and vice versa. But lags are involved so that the eye cannot discern what the full effects are. Thus to show the pervasive impact, both collectively and individually, of fluctuations in the yen/dollar exchange rate on income growth in the other East Asian countries, a more formal regression analysis is necessary.

4. THE IMPACT OF YEN/DOLLAR FLUCTUATIONS ON REGIONAL OUTPUT

Econometrically, we estimate the impact of yen/dollar fluctuations on output in the East Asian region outside of Japan. Consider first the econometric model of Kwan (2001: 38-41). For the period 1982-97, Kwan regressed the real growth rate of EA_2 (EA_1 plus China) on yearly changes in the yen/dollar exchange rate ($e_{YenDollar}$) and on real growth in the US (y_{US}). Kwan's multivariate distributed lag model of economic interdependency in East Asia is described by equation 1.

$$y_{EA_2\,t} = b_1 + b_2 y_{US_t} + b_3 e_{YenDollar_t} + b_4 e_{YenDollar_{t-1}} + u_t \qquad (1)$$

Table 3 reports our re-estimated coefficients of Kwan's model. As Kwan did, we used yearly data because quarterly data on real GDP are not available for most East Asian countries for the whole observation period. All regressions are run with yearly rates of change (first differences) to avoid problems caused by nonstationarity.[5] As Kwan found, Table 3 shows a strong inverse correlation between the yen/dollar exchange rate and growth in EA_2. For every one percent increase in the yen/dollar rate both current and lagged one year, real growth in EA_2 falls about 0.17 per cent[6].

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4 The EA_1 real growth rate (y_{EA1}) is calculated as weighted average of the real growth rates of eight (k = 8) smaller East Asian countries by the formula:

$$y_{EA_1\,t} = \sum_{i=1}^{8} y_{i\,t} \frac{Y_{i\,t}}{\sum_{i=1}^{8} Y_{i\,t}}$$

Y_i is the nominal GDP of country i in terms of dollar and y_i is the real GDP growth rate of country i.

5 For most countries the Augmented Dickey-Fuller test does not reject the null hypothesis of a unit root. Yet we view this acceptance as due to the low power of the test for our very short sample period.

6 The coefficients of the current and previous periods are added to get a long-run exchange rate multiplier, which is more fully explained below.

Table 3: Kwan-Model of Fluctuations in East Asian Output (EA_2), 1982 – 2001

US GDP Growth	Yen/Dollar Exchange Rate		Adj. R^2	Durbin-Watson
	Current	One year lag		
0.31 (1.25)			0.03	1.12
	-0.11*** (-2.97)		0.29	1.49
	-0.09** (-2.67)	-0.08** (-2.19)	0.42	1.42
0.18 (0.83)	-0.10** (-2.70)		0.28	1.40
0.19 (1.01)	-0.08** (-2.38)	-0.08** (-2.23)	0.41	1.43

Note: The dependent variable is annual output growth in EA_2. Data source: IMF: IFS, Central Bank of China. All estimations in terms of change rates (coefficients correspond to elasticities). Figures in parentheses denote t-values. * significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level.

To further investigate the transmission of business cycles in East Asia, we modified Kwan's model in four respects. First, we introduced the impact of Japanese output fluctuations on the other East Asian countries as an additional exogenous variable.[7] Second, we disaggregated Kwan's model down to the individual country level to test whether fluctuations in the yen/dollar exchange rate have a different impact on output across Asian countries. Third, we isolated the important role of China within the East Asian macro system. Fourth, we identified the cyclic spillover effects from the EA_1 countries as a whole to individual members.

The estimations are performed in three steps. In step one, we estimate only the interactive output effects in East Asia from which exchange rate effects are excluded. The impact of changes in output in the US, China, Japan and $REA1_j$ (the EA_1 countries other than the jth one being considered) on output of the single East Asian country j is estimated. In step two, we estimate the impact of the yen/dollar exchange rate on output in the East Asia countries collectively and individually—both including and excluding the crisis years of 1997-98. In step three, we draw conclusions from the combined interpretation of step one and step two.

[7] In reality Japanese growth is not exogenous, but strongly dependent on EA_1 growth. But because the main goal of this paper to describe the EA_1 business cycle, we treat Japanese growth as exogenous.

a. Measuring Output Fluctuations

In step one, we show how output fluctuations in the large countries—Japan, China, and the United States—influence output in the smaller East Asian economies. Let y_{Japan}, y_{China}, y_{US} and y_{REA1j} be annual growth in real output in Japan, China, the United States, and the rest of EA_1 (EA_1 except country j which is the dependent variable) respectively. We then regress the economic growth of country j on these variables. We don't use any lagged exogenous variables as they did not yield any significant results in previous tests. Thus the tested equation is:

$$y_j = b_1 + b_2 y_{US} + b_3 y_{Japan} + b_4 y_{China} + b_5 y_{REA1j} + u_t \qquad (2)$$

Because economic growth in Japan and $REA1_j$ are interdependent, the assumption of independence between the exogenous variables is violated. To cope with this multicollinearity problem we estimate a first regression with Japan as exogeneous variable leaving $REA1_j$ out. In a second regression we drop Japan using $REA1_j$ as exogenous variable.

The regression results are reported in Table 4, where the effect of fluctuations in each of these larger countries on the individual smaller ones is shown. There are four main findings. First, the business cycles in China and the US have no measurable impact on the output fluctuations of the smaller East Asian countries.[8] All coefficients for the US (b_2) and China (b_4) in equation 2 are insignificant.[9] Only Taiwan's output fluctuations somewhat depend on those in the United States.

Secondly, as depicted in Figure 1, the evidence for a common business cycle in the small East Asian economies is strong—as reflected by the b_5 coefficients for $REA1_j$ in equation 2. For all the EA_1 countries except Singapore and Taiwan shown in Table 4, the b_5 coefficients are significant. This coefficient is significant at the 1% level for six countries (Hong Kong, Indonesia, Korea, Malaysia, Singapore, Thailand) and at the 5% level for Taiwan. The Philippines' coefficient is significant at the 10%-level.

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8 Although not captured in our sample (1980-2001), the downturn in U.S. high tech industries in 2001--2002 did strongly affect the smaller East Asian economies, particularly Korea, Taiwan, and Singapore.

9 We don't have any reasonable explanation for the significantly negative impact of Chinese real growth on Philippine real growth.

Table 4: Mutual Determinants of East Asian Output, 1980 – 2001

j	US (ß$_2$)	Japan (ß$_3$)	China (ß$_4$)	REA1$_j$ (ß$_5$)	R^2 adj. (R^2)
Hong Kong	0.16	0.90*	0.18		0.04
	(0.34)	(1.86)	(0.61)		(0.18)
	0.07		0.11	1.04***	0.45
	(0.21)		(0.49)	(4.38)	(0.53)
Indonesia	-0.44	1.22**	0.23		0.15
	(-0.90)	(2.47)	(0.78)		(0.27)
	-0.60		0.13	1.16***	0.50
	(-1.61)		(0.56)	(4.85)	(0.58)
Korea	0.27	0.97**	0.17		0.08
	(0.57)	(2.01)	(0.58)		(0.21)
	0.25		0.10	0.84***	0.26
	(0.58)		(0.38)	(3.03)	(0.36)
Malaysia	-0.16	0.84	0.08		-0.01
	(-0.31)	(1.63)	(0.24)		(0.13)
	-0.29		-0.01	1.19***	0.57
	(-0.87)		(-0.03)	(5.50)	(0.63)
Philippines	-0.19	0.06	-0.57**		0.20
	(-0.50)	(0.15)	(-2.43)		(0.31)
	-0.25		-0.60**	0.40*	0.31
	(-0.71)		(-2.78)	(1.80)	(0.42)
Singapore	0.26	0.58	-0.13		-0.05
	(0.55)	(1.20)	(-0.45)		(0.10)
	0.19		-0.20	0.92***	0.40
	(0.52)		(-0.90)	(4.00)	(0.49)
Taiwan	0.57*	0.68**	0.14		0.30
	(1.99)	(2.35)	(0.82)		(0.40)
	0.60**		0.09	0.42**	0.34
	(2.14)		(0.54)	(2.66)	(0.43)
Thailand	-0.40	1.74***	0.30		0.36
	(-0.88)	(3.78)	(1.09)		(0.46)
	-0.57		0.18	1.43***	0.63
	(-1.63)		(0.85)	(6.10)	(0.68)
China	0.58	-0.19			0.04
	(1.65)	(-0.51)			(0.14)
	0.57			0.02	0.03
	(1.63)			(0.08)	(0.12)
EA_1	0.02	0.61**	-0.01		0.11
	(0.06)	(2.26)	(-0.08)		(0.26)
EA_2	0.31	0.45*			0.18
	(1.49)	(2.07)			(0.26)

Note: The dependent variable is annual output growth of the respective EA_2 countries. Data source: IMF: IFS, Central Bank of China. REA1$_j$ = EA_1 excluding country j. T-Statistics in Parentheses. * significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level.

Third, Japan has a important role for the business cycle of its smaller neighbouring countries. Japanese output changes have a significant impact on five out of eight East Asian countries—Hong Kong, Indonesia, Korea, Taiwan and Thailand. Malaysia is close to significance at the ten 10% level. Only the business cycles of the Philippines and Singapore seem not to be linked to Japan's. For EA_1 as a whole, the impact of the Japan's business cycle is significant at the 5% level. For EA_2 the impact of the Japan's business cycle is significant at the 10% level.

Fourth, our estimates show that neither the US, nor Japan, nor the EA_1 countries collectively significantly influence output fluctuations in China—whose business cycle seems to be relatively uncorrelated with those in other Asian countries. Why should China be comparatively immune from exogenous shocks originating abroad? First, China is a very large continental economy with a modest, albeit growing, degree of openness in trade in goods and services. Second, insulated by capital controls, China's domestic counter-cyclical policies have successfully stabilized its very high GDP growth rates (McKinnon and Schnabl, 2002). Also from Table 4, (modest) fluctuations in China's own output growth do not much impinge on the smaller East Asian economies. Consequently, despite China's rapid growth and increasing relative size, it has been an important stabilizing macroeconomic influence in the increasingly integrated East Asian economy.

b. Measuring Exchange Rate Effects

Despite the positive correlation of East Asian and Japanese output, their business cycles are far from being totally synchronized. Because of the asymmetric impact of changes in the yen/dollar exchange rate, Japanese and East Asian business cycles could diverge. The impact of a higher yen is to depress growth in Japan while stimulating it in the rest of East Asia. A weaker yen stimulates the Japanese economy while depressing growth in the smaller East Asian countries.

In step one, we measured interactive output effects while ignoring the exchange rate. Now in step two, we measure *just* the concurrent and lagged effect of the exchange rate on output in *each* of the East Asian countries. Concurrently, i.e., within the year corresponding to our annual observations, changes in the yen/dollar rate affect the competitiveness of exports (Figure 4). But also with a lag, there might be some impact via exports and foreign direct investment.

After regressing different lag lengths of the yen/dollar exchange rate on annual output changes for every East Asian country, lags of two periods or longer become insignificant. Therefore regression equation 3 uses a maximum lag of just one year.

$$y_{j_t} = g + \sum_{i=0}^{1} b_i e_{YenDollar_{t-i}} + u_t \qquad (3)$$

In equation 3, again there is the problem of multicollinearity where successive time series data on the yen/dollar exchange rate tend to be correlated. For any one estimated coefficient, its standard error is "too" large leading to an underestimation of its true t-value. However, the coefficients associated with each lag are still unbiased and efficient, and the overall fit of the model is adequately reflected in the R^2 and F-statistics. To measure the cumulative or long-run effect of a change in the yen/dollar rate, we can simply sum the two coefficients for the zero and one-year lag.

The results of so estimating equation 3 are reported in Table 5. The negative impact of the yen/dollar exchange rate on the output in the EA_1 and EA_2 is strong, both significant at the 5% level. On the individual country level changes of the yen/dollar exchange rate most strongly affect the Newly Industrialized Economies (NIEs) and Thailand, which directly compete with Japanese enterprises in EA_2, in Japan, and in third markets. The coefficients of Hong Kong, Korea and Taiwan are significant at the 5% or 10% level in the same period. The long-run coefficients—adding the impact of the concurrent and lagged period—of -0.29 for Hong Kong, -0.27 for Korea, -.20 for Taiwan, and -0.33 for Thailand are all significant at the 1% level. Taken at face value, these are big numbers. For example, a one percent depreciation of the yen against the dollar would slow Thai growth by almost one third of one percent.

In contrast, the coefficients for Indonesia, Malaysia, Philippines, and Singapore-have the expected sign without being significant. However, the fact that a depreciation of the yen against the dollar affects them all (slightly) negatively means that the "t-statistic" for any one equation likely understates its true significance.

Although China's own long-run exchange multiplier is "almost" significant, its net stabilizing influence on the other East Asian countries is better shown by comparing the highly significant regression coefficients for EA_1 and EA_2 . Table 5 shows that the long-run multiplier for a change in the yen/dollar rate on the smaller East Asian economies collectively is -0.21—but drops to -0.17 when China is included. China is much less affected by changes in the yen/dollar rate than are the others.

Table 5: Exchange Rate Determinants of East Asian Output, 1980 – 2001

	Yen/Dollar$_t$ ($ß_2$)	Yen/Dollar$_{t-1}$ ($ß_3$)	R^2 adj. (R^2)	LRM
Hong Kong	-0.18**	-0.11	0.30	-0.29***
	(-2.53)	(-1.50)	(0.36)	(-3.19)
Indonesia	-0.05	-0.13	0.02	-0.18
	(-0.49)	(-1.29)	(0.11)	(-1.54)
Korea	-0.19**	-0.08	0.25	-0.27***
	(-2.46)	(-1.03)	(0.32)	(-2.83)
Malaysia	-0.01	-0.12	-0.01	-0.13
	(-0.12)	(-1.29)	(0.09)	(1.15)
Philippines	0.02	-0.08	-0.05	-0.06
	(0.27)	(-0.98)	(0.05)	(0.61)
Singapore	-0.05	-0.07	-0.03	-0.13
	(-0.57)	(-0.84)	(0.06)	(-1.14)
Taiwan	-0.15*	-0.04	0.32	-0.20***
	(-3.08)	(-0.69)	(0.38)	(-3.17)
Thailand	-0.11	-0.22**	0.27	-0.33***
	(-1.26)	(-2.50)	(0.34)	(-3.04)
China	-0.07	-0.08	0.04	-0.15*
	(-1.06)	(-1.09)	(0.14)	(-1.79)
Japan	0.01	-0.05	-0.02	-0.04
	(0.18	(-1.22)	(-0.07)	(-0.81)
EA_1	-0.12**	-0.09*	0.32	-0.21***
	(-2.37)	(-1.83)	(0.38)	(-3.35)
EA_2	-0.09**	-0.08**	0.42	-0.17***
	(-2.75)	(-2.34)	(0.47)	(-4.10)

Note: The dependent variable is annual output growth. Data source: IMF: IFS, Central Bank of China. LRM = long-run exchange rate multiplier. T-Statistics in Parentheses. * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level.

c. The Crisis Years, 1997-98

Could it be that our demonstration of the strength of fluctuations in the yen/dollar exchange rate is biased by an outlying observation?[10] In 1997-98 the steep downturn in output in EA_1 was coupled with a deep depreciation of the yen. By June 1998, the yen had fallen to 147 to the dollar (Figure 1) and had to be propped up by the Bank of Japan and the US Federal Reserve Bank jointly intervening to buy yen and sell dollars. This intervention was successful, and the yen began to rise well into the year 2000—a rise which corresponded with the economic recovery in EA_1. All of this is

[10] We are indebted to an outside referee for suggesting this possibility.

consistent with our model of the effect of the yen/dollar rate on the collective output of the EA_1 countries.

But suppose the 1997-98 downturn in EA_1 was mainly caused by an "extraneous" event: the excessive build up of short-term dollar and yen liabilities in banks in Indonesia, Korea, Malaysia, Philippines, and Thailand, used for onlending at higher interest rates in their domestic currencies (McKinnon and Pill, 1999). The resulting, highly contagious, currency attacks forced massive depreciations in the currencies of these countries against the dollar (and even against the fallen yen) which resulted in a wave of bankruptcies throughout their economies. The fall in output in these crisis economies then spread to Singapore and Taiwan to create the sharp regional downturn. (Because of strong counter cyclical measures, China managed to avoid this fate while leaving its dollar exchange rate unchanged). From this vantage point, the downturn was not primarily caused by the yen depreciation of the 1996-98. Therefore, to check for the robustness of the estimation results reported in Table 4, the crisis years 1997/98 are excluded from the estimation.

Table 6 reports the results of excluding observations from 1997 and 1998. The impact of the yen/dollar exchange rate on EA_1 and EA_2 remains strong and invariant (as in Table 5) to leaving out the crisis years. The long-run multipliers are significant for the region as a whole at the five percent level for EA_1 and one percent level for EA_2 .

At the individual country level in Table 6, the output growth in the NIEs Hong Kong, Korea and Taiwan is affected still strongly by yen/dollar exchange rate fluctuations. The coefficients of Hong Kong, Korea, and Taiwan are all significant. The long-run multipliers for these three countries are large.

The ASEAN core countries Indonesia, Malaysia and Philippines are not as strongly affected and the coefficients are insignificant. While for Thailand the coefficient remains high, it becomes insignificant in contrast to the overall sample reported in Table 5. Table 6 also underlines the special position of China and Singapore which were not very strongly affected by the yen/dollar fluctuations. Overall, Table 5 and Table 6 strongly support our view that the common EA_1 business cycle is generated largely by fluctuations in the yen/dollar exchange rate.

However, this is not to deny that the frenzy of overborrowing in foreign currencies from 1994 to 1996 was an important factor contributing to the crash of 1997-98. But this seems (at least one hopes!) to be a "one-time" event. Nevertheless, the depreciation of the yen over 1996-98 definitely made the downturn worse. More generally,

fluctuations in the yen/dollar rate seem to be a continual (rather than a "one off") source of disturbance generating cyclical fluctuations in the East Asian economy.

Table 6: Exchange Rate Determinants of East Asian Output, 1980 – 2001 (crisis years 1997/98 excluded)

	Yen/Dollar$_t$ (ß$_2$)	**Yen/Dollar$_{t-1}$ (ß$_3$)**	**R^2 adj. (R^2)**	**LRM**
Hong Kong	-0.18**	-0.11*	0.21	-0.29**
	(-2.30)	(-1.28)	(0.29)	(-2.63)
Indonesia	-0.01	-0.06	-0.08	-0.07
	(-0.11)	(-0.55)	(0.02)	(-0.50)
Korea	-0.17*	-0.05	0.11	-0.22*
	(-1.98)	(-0.51)	(0.18)	(-1.80)
Malaysia	0.00	-0.08	-0.07	-0.08
	(0.09)	(-0.79)	(0.03)	(0.59)
Philippines	0.01	-0.10	-0.03	-0.09
	(0.12)	(-1.13)	(-0.06)	(-0.79)
Singapore	-0.05	-0.07	-0.05	-0.12
	(-0.54)	(-0.74)	(0.05)	(-0.97)
Taiwan	-0.17***	-0.06	0.35	-0.23***
	(-3.36)	(-1.14)	(0.41)	(-3.21)
Thailand	-0.07	-0.15	0.02	-0.23
	(-0.68)	(-1.32)	(0.11)	(-1.65)
China	-0.07	-0.09	0.05	-0.16
	(-1.10)	(-1.26)	(0.14)	(-1.65)
Japan	0.12	-0.03	-0.07	0.09
	(0.37)	(-0.75)	0.03)	(1.54)
EA_1	-0.11*	-0.08*	0.15	-0.19**
	(-1.90)	(-1.21)	(0.23)	(-2.32)
EA_2	-0.09**	-0.08*	0.26	-0.17***
	(-2.27)	(-1.80)	(0.32)	(-3.14)

Note: The dependent variable is annual output growth. Data source: IMF: IFS, Central Bank of China. LRM = long-run exchange rate multiplier. T-Statistics in Parentheses. * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level.

d. Combining Output and Exchange Rate Effects

In steps one and two, interactive output effects (Table 4) and exchange rate effects (Table 5) were estimated. We observed that the NIEs Hong Kong, Korea and Taiwan are strongly affected by fluctuations of the yen/dollar exchange rate, while for the ASEAN core countries this effect is much weaker. Nevertheless, the impact on the smaller East Asian countries as a group (EA_1) is strong. How can the strong impact on EA_1 be explained?

The answer lies within the pattern of East Asian division of labour. Within the East Asian production chain, the ASEAN core countries have presumed the role of subcontractors or suppliers for the industrially more developed NIEs—Hong Kong, Korea, and Taiwan (Urata, 2001). This intra-Asian pattern of division of labour contributes to the synchronized business cycle. If the yen/dollar rate changes, the NIEs are more directly affected than are the ASEAN core countries. But, the ASEAN core countries are still affected indirectly by intra-East Asian income effects.

e. The relative shrinkage in Japan's economy

As shown in Table 2, EA_1 trade with Japan has substantially declined since the early 1980s. While in 1980 almost 20 per cent of EA_1 exports went to Japan, in the year 2001 the value had fallen to 10 per cent. The relative fall in imports from Japan is less pronounced but similar. This relative decline of EA_1 trade with Japan would suggest that the impact of the yen/dollar exchange rate on EA_1 trade has weakened and will further weaken if this development continues. But there are two other considerations offsetting this effect of declining Japanese trade with East Asia.

First, the fluctuations in the yen/dollar exchange rate not only affect trade with Japan but also affect the competitiveness of EA_2 exports in third markets. As the yen depreciates, the exports of Hong Kong, Korea, Taiwan, and perhaps eventually China, lose competitiveness against Japanese competitors in the US and Europe. However, as shown in Table 2, the US and ROW still make up 50 per cent of EA_1 exports and 40 per cent of EA_1 imports. This suggests that these third market effects account for a crucial part of the impact of the yen/dollar rate on East Asia. Against this effect however, is the relative shrinkage of Japan as a supplier into third markets if Japan's economic malaise were to continue.

Second, although the Japanese economy may continue its relative decline, the *leverage effect* of fluctuations in the yen/dollar rate on the rest of East Asia could still increase. Table 1 shows the remarkably increasing economic integration of the smaller East Asian countries with each other. Thus a common external disturbance, i.e., a change in the yen/dollar rate, has an increasing impact on their common business cycle as they become more integrated. To some (unknown) degree, this leverage effect could well offset (into the indefinite future) continual relative shrinkage in the

size of Japan's economy. As long as the yen/dollar rate fluctuates, we don't expect the synchronized East Asian business cycle to disappear any time soon.

f. Japan's Interaction with the Smaller East Asian Economies: A Summary

To summarize the main sources of instability in the East Asian economy, Table 7 is a taxonomy of the macroeconomic impact of events in the Japanese economy—changes in the yen/dollar rate and Japan's business cycle—on the income of EA_1. There are four possible combinations of changes in the yen/dollar rate and upswings or downswings in Japanese income. The plus signs in the body of the table indicate an expansionary effect on EA1—with minus signs indicating contraction.

Table 7: Economic Interaction between Japan and EA_1

	Upswing in Japan	**Downswing in Japan**
Yen appreciation	① + / +	③ – / +
Yen depreciation	② – / +	④ – / –

+ indicates a positive impact on y_{EA1}, and a – indicates a negative impact on y_{EA1}.

Case ① is the best outcome for EA_1 countries. The yen appreciates against the dollar while the Japanese economy is expanding. The positive income effect and exchange rate effect reinforce each other to stimulate aggregate output. But discrete episodes are difficult to identify in the data.

Case ④ is the worst outcome for the EA_1 countries. Yen depreciation is aggravated by an economic downswing in Japan. This case was observed during the Asian crisis of 1997-98 when Japanese income turned down as the yen fell.

Case ② applied in 1986-87 and again in the early 1990s up to 1995. In each episode, the strong yen was accompanied by a recession in Japan, what was widely characterised as "*high-yen induced recession*" (*endaka fukyô*). While the recessions had a negative effect on the EA_1 economies, the yen appreciations boosted growth—with this exchange rate effect predominating. The EA_1 economies experienced high growth in both cases.

Case ③ seems to apply from mid 1995 through 1996. Japan's output increased as the yen declined. The initial net affect on EA_1 was positive. But eventually the falling yen—which bottomed out at 147 to the dollar in June 1998—helped provoke the great Asian crisis, putting us back into Case ④.

Again we learn that the exchange rate effect usually dominates the income effect—an important empirical regularity to keep in mind when we discuss whether a deep devaluation of the yen would permit Japan to export its way out of its current slump.

5. CONCLUSION

Our message is clear: the yen should not be depreciated below some rough measure of purchasing power parity (PPP)—as per the current rate of about 120 yen per dollar—to "boost" the Japanese economy. More generally, ongoing fluctuations in the yen/dollar rate around PPP increase the volatility of the business cycle in the smaller East Asian economies. They would be much better off if the yen was permanently tethered.

Other economists have recognized how fluctuations in the yen/dollar rate destabilize economies in the ever-more-integrated East Asia region. But their common policy "solution" is to give the yen more weight in the exchange rate baskets of the nine EA_2 countries (Williamson, 2000; Kwan, 2001). However, this proposed solution is misplaced. Why change the monetary and exchange rate policies of nine East Asian countries—including big ones like China and Korea—whose revealed preferences are to peg to the dollar (McKinnon and Schnabl, 2002), when changing just Japan's would be sufficient?

Putting the matter more positively for Japan itself, Goyal and McKinnon (2003) show that the fluctuating yen has been a prime cause of Japan's low-interest rate liquidity trap and its failure to escape from the ongoing slump. Thus, stabilizing the yen/dollar rate in nominal terms indefinitely would benefit Japan on the one hand and its East Asian neighbours on the other. But for any such exchange rate agreement to be credible would require the cooperation of the United States—specifically through joint action by the US Federal Reserve Bank and the Bank of Japan (McKinnon and Ohno, 1997, 2001). But that is a story for another time.

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